

Development of Lead-Bismuth Eutectic Sub-Channel Code Available for Wire Spacer

Authors : Qi Lu, Jian Deng, Daishun Huang, Chao Guo

Abstract : The lead cooled fast reactor is considered as one of the most potential Generation IV nuclear systems due to the low working pressure, the appreciable neutron economy, and the considerable passive characteristics. Meanwhile, the lead bismuth eutectic (LBE) has the related advantages of lead with the weaker corrosiveness, which has been paid much attention by recent decades. Moreover, the sub-channel code is a necessary analysis tool for the reactor thermal-hydraulic design and safety analysis, which has been developed combined with the accumulation of LBE experimental data and the understanding of physical phenomena. In this study, a sub-channel code available for LBE was developed, and the corresponding geometric characterization method of typical sub-channels was described in detail, especially for the fuel assembly with wire spacer. As for this sub-channel code, the transversal thermal conduction through gap was taken into account. In addition, the physical properties, the heat transfer model, the flow resistance model and the turbulent mixing model were analyzed. Finally, the thermal-hydraulic experiments of LBE conducted on THEADES (THERmal-hydraulics and Ads DESign) were selected as the evaluation data of this sub-channel code, including 19 rods with wire spacer, and the calculated results were in good agreement with the experimental results.

Keywords : lead bismuth eutectic, sub-channel code, wire spacer, transversal thermal conduction

Conference Title : ICHTA 2020 : International Conference on Heat Transfer and Applications

Conference Location : Tokyo, Japan

Conference Dates : November 17-18, 2020